fessor may achieve! But the experiment usually serves only to continue through four years further a task which a brief glance through the school pedigree would have shown to be hopeless against hope. Education must in some way have its basis of selection and differentiation no less efficient than has been that of organic nature. One of the most hopeful of these means, so far as the writer can perceive, is through what may be designated as educational eugenics, the application of the principles of eugenics to problems of mind to the function of the schools, and preeminently to the college and university, in the same general way through which we are presuming to secure better social and racial germ plasms.

Assuming what is now generally conceded, that all human characteristics are inherited in probably equal degree, and this must include mental traits and aptitudes, then it is not utopian to anticipate the existence of potentialities of intellect which it may be possible to distinguish early in development, if indeed they may not be predicted on some basis such as Mendelism, and which may serve as an index of fitness for or against prospective scholastic eminence of such nature as to warrant encouragement or inhibition, as the case may be. This does not imply that all educational effort need be intercepted; to the contrary, it means rather differentiation of aims and methods. One may give no promise whatever of fitness for distinctively literary or scientific or pedagogical education, yet may be safely directed toward technical, vocational or industrial education. In other words, our program, like that of eugenics in general, should be selective in both a positive and a negative sense; fitness should be sought and fostered in every reasonable way, while the unfit should be deflected or diverted into avenues in which some outlook may prompt specialized training adapted to such betterment as may be within realization.

Let me close as I began, with a call for ampler and more critical vital statistics. They are needed in almost every phase of our complex modern social and civil life. They can be made contributory to health, to moral and social conservation, and, as it seems to me, to educational progress toward a degree of efficiency and excellence for which it will no longer be necessary to apologize or explain.

Chas. W. Hargitt
Syracuse University

To Trace the Lines of Force in an Electrostatic Field

Mr. R. F. D'Arcy describes an arrangement for tracing the lines of force of an electrostatic field in *Nature,* of March 20. Mr. D'Arcy's method is to support a metal ball at the top of a tall glass tube standing upon a float in a tray of mercury. Then, according to Mr. D'Arcy, the insulated ball follows the horizontal lines of force of the electric field between the properly placed terminals of a large electric machine.

Another method for tracing the lines of force in an electric field is described by Mr. B. M. Neville in *Nature* of April 3. Mr. Neville simply allows a scrap of cotton-wool to fall between the knobs of an electric machine. As soon as the bit of cotton-wool touches one of the terminals it becomes charged and moves off rapidly along a line of force.

The most satisfactory method known to the writer for tracing the lines of force in an electrostatic field is to suspend a toothpick by fine thread from the end of a long handle. When placed in the electric field the suspended toothpick behaves exactly like a compass in a magnetic field, and points in the direction of the field.

The method suggested by Mr. D'Arcy is open to the objection that an insulated metal ball does not, in general, tend to move along the lines of force in an electric field. The objection to Mr. Neville's arrangement is that the piece of cotton-wool moves too rapidly.

W. S. Franklin

High School Botany

The fact that an idea is a decade old is not necessarily a recommendation for it; but if it

remains in use after that time it is evident that it has worn well in at least one person's head. The present standard secondary course in botany has been in use in a large part of the United States for somewhat more than that time. At about the time it congealed into a fixed and generally understood course, I was teaching both college and preparatory botany in the University of West Virginia. As a teacher of botany, I was naturally much interested in the subject and took advantage of every opportunity to examine its workings. At the same time, I took care that none of my own students failed to get a decent familiarity with botany as it had previously been taught in the high schools; that is, with a knowledge of the flowering plants growing in the vicinity. As to the wisdom of including the study of individual flowering plants, my opinion has grown stronger with the years.

During the last seven years I have seen and overseen a very large amount of botanical teaching, including the work of more than twenty teachers. In two high schools and in the work given students of high school grade in the College of Agriculture of the University of the Philippines, the course has been as outlined in Bulletin 24 of the Insular Bureau of Education. This course is really general botany, including the general facts and principles of morphology and physiology, including also drill in the determination of plants by means of keys, and the preparation of an herbarium of fifty determined species. In a considerable number of high schools where the teachers had had the usual first year of college botany and no other preparation in the subject, the outline in this bulletin was found not to be an adequate guide for their work, and the course given was accordingly as near as they could come to the standard high school course, with the help of one or another of the texts in most general use in the States. All possible assistance, including the distribution of numerous determined plants, was given these teachers, in the attempt to make their teaching "alive." So much depends upon the teaching ability of the teacher that a comparison of results even when judgment is based on familiarity with the subsequent work of a large number of students is not sure to be fair. But it certainly has been the case here that the students who were given instruction modeled after the standard American course have on the whole proved less interested in the subject, and less familiar with it, than those whose course had followed the local outline.

The students in the latter course get a first-hand knowledge of the plant cell, of the characteristic tissues of the higher plants, and of some of the typical plants illustrating the course of evolution. They learn accuracy, if the teacher teaches it, very much as they would in some other course. They are taught to think; enough for instance to be able to explain why the great groups of plants are characterized by their reproductive structures. They get a better idea of the variety and resourcefulness of nature than American students can be given, but this is because so many of the things we used to have to take on faith are growing about them. Also, and this is the characteristic of the course, each student becomes better acquainted with a considerable number of plants which he is already used to seeing, by determining them with a key and preparing them for his herbarium.

The teaching of botany should serve several uses. It should teach accuracy in observation and in depiction. It should help to create the habit of accurate thought. It should equip the students with a considerable amount of practical information. It should also give them an interest in the subject, which will stay with them after they get their credit and leave the class room. The standard course is essentially inadequate in two respects. It does not convey such information, which will be useful to many of those who have taken it, as it well might do. And it does not give the majority of those who take it an interest in the subject which will abide with them. The reason for the latter failure is that the course does not deal as it should do with things which are already familiar and interesting to the student, and does not include exercises of a kind which most of the students can have anything to do with after they leave school.

An interest in plants is a natural one. Plants are everywhere about us, and are useful in many and exceedingly important ways. The botanical teaching of the last ten or fifteen years has been missing its opportunity to serve and take advantage of this interest, by busying itself too exclusively with plants which most people never see except in the class room, and in which they have no practical interest.

The old course of study made better use in many respects of one term than the newer course has done of a year. It left much to be desired and the newer course made up its shortcomings; but it did this at too great an expense when it threw away the familiarity with the different kinds of common flowering plants, and the excursions, and the love of the woods which the students gained in old-time classes. There are hopeful signs of a backward swing of the pendulum. And it is well that this come before field botany is quite forgotten.

E. B. Copeland

INDOOR HUMIDITY

To the Editor of Science: Notwithstanding the conclusions reached in Dr. Ingersoll's interesting letter on this topic, something may perhaps be said in favor of a humidity considerably higher than 40 per cent., and nearer the 66 or 70 per cent. favored by "most authorities."

The writer has made experiments similar to those of Dr. Ingersoll, but with the following differences: gallons evaporated per day, 18 to 20, instead of 25 or more; volume of house actually served by the hot and humid air supply, 17,000 instead of 20,000 cubic feet; humidity maintained with comfort, over 60 per cent., instead of 40 per cent. Another important factor, and there are yet more, is that of house temperature. Unfortunately, Dr. Ingersoll has omitted any mention of this; but, judging from common American practise, one may, perhaps, assume a day temperature of 70°. Now in a Scots household, such as the writer's, a temperature nearer 60° is thought more comfortable, and was that aimed at in our experiments. And herein enters the most interesting feature of the case, that the weight of water present per cubic foot, and hence the possible amount of dew deposit, is approximately the same with 40 per cent. saturation at 70° as with 60 per cent. saturation at 60°! Thus, after all, those at least of the authorities that are European may not be so far wrong in their estimate, and, truly, one does like to say a little, if only occasionally, in favor of the authorities.

The writer would agree most heartily with Dr. Ingersoll in the statement that any serious effort to raise the indoor humidity is very well worth while.

Alan W. C. Menzies

Oberlin, Ohio

SCIENTIFIC BOOKS

The Purchasing Power of Money; Its Determination and Relation to Credit, Interest and Crises. By Irving Fisher, assisted by Harry G. Brown. New York, The Macmillan Company. 1911. Pp. xxii + 505.

Although Irving Fisher is a good propagandist and can use arguments which appeal to the man in the street, his reasoning is based upon critical, logical, scientific analysis. One of the propositions which he has recently been actively promoting is international monetary reform looking toward the elimination or restriction of those disastrously wide variations in prices which may be due to the irregularities of the world's gold production. The principles upon which his suggestions for regulating the general price level are based are expounded in his "Purchasing Power of Money." An early proficiency in mathematics and interest in the mathematical theory of prices has led him naturally to a quantitative or quantity theory of money which he builds up with a deep knowledge and appreciation of scientific method. This attitude is a justification for Science to show an interest in his work which it could hardly exhibit in the case of ordinary studies in economics.